

## The Disconnect Between Engineering Students' Desire to Discuss Racial Injustice in the Classroom and Faculty Anxieties

**Dr. Tracy Anne Hammond, Texas A&M University**

Dr. Hammond is Director of the Texas A&M University Institute for Engineering Education & Innovation and also the chair of the Engineering Education Faculty. She is also Director of the Sketch Recognition Lab and Professor in the Department of Computer Science & Engineering. She is a member of the Center for Population and Aging, the Center for Remote Health Technologies & Systems as well as the Institute for Data Science. Hammond is a PI for over 13 million in funded research, from NSF, DARPA, Google, Microsoft, and others. Hammond holds a Ph.D. in Computer Science and FTO (Finance Technology Option) from the Massachusetts Institute of Technology, and four degrees from Columbia University: an M.S. in Anthropology, an M.S. in Computer Science, a B.A. in Mathematics, and a B.S. in Applied Mathematics and Physics. Hammond advised 17 UG theses, 29 MS theses, and 10 Ph.D. dissertations. Hammond is the 2020 recipient of the TEES Faculty Fellows Award and the 2011 recipient of the Charles H. Barclay, Jr. '45 Faculty Fellow Award. Hammond has been featured on the Discovery Channel and other news sources. Hammond is dedicated to diversity and equity, which is reflected in her publications, research, teaching, service, and mentoring. More at <http://srl.tamu.edu> and <http://ieei.tamu.edu>.

**Samantha Ray, Texas A&M University**

Samantha Ray is a Computer Engineering PhD student at Texas A&M University. Her research focuses on creating intelligent systems for tasks that require human-like levels of understanding. She has previously worked on human activity recognition (HAR) systems for promoting healthy habits and educational tools using sketch recognition and eye tracking.

**Dr. Paul Taele, Texas A&M University**

Paul Taele, PhD, is an Instructional Assistant Professor in the College of Engineering's Department of Computer Science and Engineering at Texas A&M University. He is also the Assistant Lab Director at the Sketch Recognition Lab.

**Dr. Shawna Thomas, Texas A&M University**

Dr. Thomas is an Instructional Assistant Professor in the Department of Computer Science and Engineering at Texas A&M University. She is a member of the Engineering Education Faculty in the Institute for Engineering Education & Innovation at Texas A&M. She enjoys project-based learning and incorporating active learning techniques in all her courses. She received her Ph.D. from Texas A&M University in 2010, focusing on developing robotic motion planning algorithms and applying them to computational biology problems including protein folding. She continued this work as a Postdoctoral Research Associate and then as an Assistant Research Scientist until transitioning to teaching. She has also worked as an algorithmic consultant in digital oral care, leveraging her research experience in modeling motion.

**Dr. Karan Watson P.E., Texas A&M University**

Karan L. Watson, Ph.D., P.E., is currently a Regents Senior Professor of Electrical and Computer Engineering, having joined the faculty at Texas A&M University in 1983 as an Assistant Professor. She is also serving as the C0-Director of the Institute for Engineering Education and Innovation. She has served in numerous roles at Texas A&M University, including: Provost and Executive Vice President (2009-2017), Vice Provost (2009), Dean of Faculties and Associate Provost (2002-2009), Interim VP for Diversity (2009 & 2005-2006), Associate Dean of Engineering (1996-2001), and Assistant Dean of Engineering (1991-2006). Dr. Watson is a fellow of the Institute of Electrical and Electronic Engineers (IEEE), the American Society for Engineering Education, and the Accreditation Board for Engineering and Technology (ABET). Her awards and recognitions include the U.S. President's Award for Mentoring Minorities and Women in Science and Technology, the American Association for the Advancement of Science mentoring award, the IEEE International Undergraduate Teaching Medal, the WEPAN Beville Watford Award,

the College of Engineering Crawford Teaching Award, and two University-level Distinguished Achievement Awards from The Texas A&M University Association of Former Students—one in Student Relations in 1992 and in Administration in 2010, and the Texas Tech College of Engineering Distinguished Alumni. In 2003–2004, she served as a Senior Fellow of the National Academy of Engineering Center for the Advancement of Scholarship in Engineering Education. Since 1991, she has served as an accreditation evaluator, commissioner, Board of Director, then President of ABET, and is currently Secretary/Treasurer of the ABET Foundation Board of Directors. She has also served as a program evaluator for J.D. programs for the ABA, for universities' regional accreditation for SACSCOC, and for Business Schools for AACSB. She also has served as the Chair of the ECE division of ASEE, the President of the Education Society of IEEE, and the chair of the Women in Engineering of IEEE. She served as the Treasurer and a Board of Directors member for WEPAN.

## **Dr. Christine A. Stanley, Texas A&M University**

Christine A. Stanley is professor of higher education, holder of the Ruth Harrington Endowed Chair, and vice president and associate provost for diversity emerita in the College of Education and Human Development at Texas A&M University. A past president of the Professional and Organizational Development (POD) Network in Higher Education, she is a recipient of numerous university and national awards including the Outstanding Staff Award from The Ohio State University, TAMU Women's Faculty Network (WFN) Award for Mentoring, the Outstanding New Faculty Award from the College of Education Development Council, the Mildred Garcia Award for Exemplary Scholarship for a Senior-Practitioner Scholar from the Association for the Study of Higher Education (ASHE), and two awards from the Professional and Organizational Development Network in Higher Education—the Robert Pierleoni Spirit of POD Award for leadership efforts in diversity and, the named Christine A. Stanley Award for Diversity and Inclusion Research in Educational Development. Dr. Stanley has edited 5 books, over 70 peer-reviewed publications, and her research focuses on faculty professional development, administrator development, and the experiences of minoritized faculty in predominantly White colleges and universities.

## **Mr. Seth Polsley, Texas A&M University**

Seth Polsley is a PhD student at Texas A and M University in the Sketch Recognition Lab under Director Tracy Hammond. His research interests may be broadly classified as "intelligent systems," with an emphasis on studying and building interactions that merge the capabilities of computers with the intuitive behaviors of humans. He holds a Masters and Bachelors in Computer Engineering from Texas A and M and University of Kansas, respectively, and has previously worked at Lexmark International and MIT Lincoln Lab.

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**Tracy Hammond**

Institute for Engineering Education & Innovation, Engineering Education Faculty  
Sketch Recognition Lab, Department of Computer Science & Engineering  
Texas A&M University

**Samantha Ray**

Sketch Recognition Lab  
Department of Computer Science & Engineering  
Texas A&M University

**Paul Taele, Shawna Thomas**

Engineering Education Faculty  
Department of Computer Science & Engineering  
Texas A&M University

**Karan Watson**

Engineering Education Faculty  
Department of Electrical and Computer Engineering  
Texas A&M University

**Christine Stanley**

Engineering Education Faculty  
Department of Educational Administration & Human Development  
Texas A&M University

**Seth Polsley**

Sketch Recognition Lab  
Department of Computer Science & Engineering  
Texas A&M University

## **Abstract**

Protests against racial injustice have been increasing in the United States. Universities often rapidly respond to acts of injustice through public statements about their position to uphold the equality of all people. To gauge the desires and concerns around discussing events causing social unrest in engineering classrooms specifically, the engineering education faculty chair of a large university conducted discussions with both students and faculty regarding its place in their classrooms. This paper describes the emerging themes from survey responses using coding and grounded theory. Reactions from students and faculty were decidedly different. Most students stressed the importance of discussing such topics in class with their engineering faculty, while most faculty emphasized their concerns with doing so due to their lack of training to effectively

handle such topics. This paper describes the evaluation of student and faculty responses and its implications for supporting diversity and inclusion in the engineering classroom.

## **Introduction**

On May 25th, 2020, George Floyd's death shook Americans everywhere. It was representative of the racial injustice that continues to be rampant in the United States. Protests rose across the nation, with the government decidedly against these public expressions of outrage. Universities responded with statements honoring George Floyd and giving calls to action to make meaningful and lasting change to create a more equitable future for everyone. Such statements implied that this was not a matter of politics but instead a matter of human rights.

Concerned that engineering students would have no support in addressing and coping with this event in their classes (or events like these), the engineering education faculty chair of a large university sought to gauge students' interest in discussing racial justice in their engineering classes and faculty's plans to support students in light of the stressors caused by building social unrest. The chair surveyed both groups for their perspective on the role of such discussions in the engineering classroom.

This paper reports on the central themes that emerged from both student and faculty responses. We performed coding and grounded theory on the student and faculty responses to extract common themes and patterns. The reactions were decidedly different. 74 of the 86 student responses stressed the importance of engineering faculty to discuss such topics in class and provided ideas about how to do this. Conversely, 18 of 20 faculty emphasized their fear or concern about discussing such issues in the classroom, feeling ill-equipped to discuss it at all or unsure of how effective they would be in a virtual classroom. They were not against the discussion inherently but were instead anxious about their abilities and impact on the students. Many of the faculty voiced their desire to create inclusive classrooms and a desire to support the students in these anxiety-inducing times, but their concerns of mishandling these issues overpowered this goal.

We also performed Chi-Square ( $\chi^2$ ) analysis on aligned categories that arose from the grounded theory. We found that students were more interested in having such topics discussed in the classroom than expected and that faculty are highly aware of their impact on the students, feeding to their fear about saying the wrong thing.

The disconnect between the two groups often results in explicitly marginalizing classroom environments, i.e., environments where students feel unwelcome from blatantly marginalizing or discriminatory behaviors [1]. The data demonstrates that faculty are interested in developing implicitly inclusive classrooms but fear that their lack of expertise on these topics will lead to

failure and having a negative impact on students. However, students voiced strong support and interest in having faculty discuss and teach about inclusivity and ethics in their engineering classrooms. To create implicitly inclusive environments, faculty are encouraged to acknowledge and discuss such topics in their classes and provide opportunities for the students to share their thoughts. Faculty have several avenues for such opportunities including surveys and discussion boards for open channels of communication, class discussions, supplemental reading, and reflection assignments.

This paper details the predominant themes found through qualitative analysis on responses from both the faculty and the students, the myriad of resulting positive outcomes, and various low-risk methods for addressing such issues in the classroom. The observations, analysis, and conclusions drawn in this paper can be used to help foster implicitly inclusive classrooms.

## **Related Works**

Many factors impact student learning, the classroom, and how discussions of sensitive topics, including those centered around race, are facilitated and received. These all shed light on both student and faculty perspectives regarding racial discourse in the classroom. We first review how student learning is influenced by an inclusive classroom. We then discuss common perspectives around having these difficult conversations. Finally we present ways that student development, identity, and stereotypes can impact these faculty-facilitated discussions.

*Role of Inclusivity in Student Learning.* Inclusivity plays a major role in student learning [1]. Two representative examples from [1] demonstrate the effects of inclusivity in such student learning scenarios:

1. Professor discusses an article talking about the cost of illegal immigrants to the US Economy. Student 1 says that one should discuss figures and facts without getting personal. Student 2 is personally offended by something Student 3 says illegal immigrants should be arrested and deported.
  - a. Outcome: The entire thing results in a heated argument, resulting in the whole class getting uncomfortable.
2. In the second example, the Professor goes out of his way to encourage women in the classroom, provides extra help and avoids calling on them to put them on the spot. One of his TA's is then reported for making a derogatory comment against women in Engineering. This results in one of the more promising students dropping his class altogether.
  - a. Outcome: During his course evaluations female students felt that they were being patronized while male students felt that the class was unfair to them.

From both these examples, emotional and social methods can hinder a student's capability to be productive and learn. Students are not just intellectual beings but also social and emotional beings. They bring their past experiences (positive and negative) into the course which if not addressed can hinder learning and growth [1]. The learning experience has been made more complex and difficult by unexpected socio-economic dynamics that take place in the classroom [2] and by recent social unrest outside the classroom [3–7]. Faculty, aware of this complexity, must decide if and how to engage in issues affecting their students, including issues of race.

In his study of more than 200,000 students and 25,000 faculty at 200 institutions, Astin [8] recognized the numerous influences that contribute to the entire college experience as a whole. "Faculty Student Orientation" was the factor that corresponded to course climate the most and included student insights and observations on whether faculty are interested in students' academic problems, care about minorities, are approachable outside of class and are humane. This factor significantly influences student retention, determines the number of students who graduate, and increases students' critical thinking and problem solving skills. Seymour and Hewitt [9] observed the cases of several women and minority students who ended up leaving the sciences, which led them to transfer to fields where race and gender were genuine lenses of analysis. Astin's study [8] recognized a factor called "Faculty Diversity Orientation" that included readings on gender, inclusion and race in the syllabus. This factor was found to constructively influence a student's GPA.

*Facilitating Racial Dialogues in College Classrooms.* One of the best ways to address racism is not through additional training programs and knowledge acquisition, but through constructive conversations between faculty and students within their classrooms [10]. These conversations present a host of learning opportunities for exploring racial issues [11]. They can reduce prejudice, increase empathy, dismantle stereotypes, and support mutual respect [12–13]. Why aren't more faculty employing such dialogues in their classrooms?

Many White faculty are reluctant because they view them as outside their course's content or strictly taboo [13–15] while others voice high anxiety levels and are unwilling to take the risk in their classrooms [13,16], often avoiding such topics [17]. Some are worried that racial dialogues will stir up unnecessary hostility, that they may lose control of the situation, or they feel unqualified to facilitate these conversations [17–21]. Racial dialogues may be particularly difficult because they can expose differences in perspective, are public, and can become quickly emotionally charged.

Fears of discussing racial issues are not only experienced by White faculty. While these discussions are most frequently conducted by Black faculty [21–24], it is not without significant anxiety and concern. Black faculty report that they are worried about how they will be perceived by their colleagues if they discuss Black perspectives in their classrooms [25–26]. Some are

already experiencing disrespect from their White students [25–30], making them more reluctant to bring more attention to race.

Students also often associate racial dialogues with negative emotions and experiences. Black students report being prevented from bringing up these topics because they fear the consequences from both faculty and students and they feel they will not be openly received [12–13,23,31–33]. White students are often compelled to become defensive of their actions and intentions or to even leave the classroom [21]. Many remain silent to avoid the risk of exposing their unknown biases [32–33] or in reaction to feelings of guilt [34].

All students consistently associate the success or failure of a racial discussion directly with the knowledge and skills of the facilitating faculty, regardless of their race [21]. This validates faculty's concern with assuming the risk of such conversations. Faculty preparation is critical in supporting racial dialogues [35], and many faculty lack training to effectively engage these topics in their classes [23].

*Role of Student Development in Learning and Facilitating Racial Dialogue.* Social and emotional gains developed by students during college are significantly more than the intellectual gains over the same time period [36]. These emotions can overburden a student's mind if not steered appropriately. Understanding the development process is key in shaping the classroom climate from a broader perspective.

College students between the ages of seventeen and twenty-two are faced with several socio-economic, emotional and intellectual challenges. Faculty must identify these challenges before trying to address them or before engaging in difficult dialogues, including those centered on race. They must also put them into context of the student's development, which is individual and non-linear (can halt or even regress in some areas). There are many different models of student development. Chickering provides seven vectors that build on each other increasingly and try to methodically account for all the developmental changes students go through at college [37]. These include developing competence, developing autonomy, establishing identity, freeing interpersonal relationships, developing purpose, and developing integrity. These impact student learning in the classroom and their identities in their chosen career.

Other models describe a student's path from rudimentary to a more complex train of thought and intellectual development [38–40]. The student's current development level in this process has a profound impact on racial discourse in the classroom:

- Initially, students approach knowledge as either right or wrong, an elementary **duality** (or dichotomy). Students at this stage cannot tell the difference between several perspectives and are less likely to see debates and discussions about race as a way to improve their knowledge, understanding, or empathy towards others. At this stage, women may tend to focus on helping each other become experts in a particular subject matter, while men may

choose to exhibit their knowledge in front of their peers [38]. Faculty must be aware of these complex relationships between development, reception, and action.

- At the next state, the **multiplistic** stage, all opinions seem legitimate and a student has difficulty differentiating between them. As such, students may be more receptive to racial dialog at this stage. They also do not see the instructor as the authority, but as another perspective. This may reduce some of the association with dialog failure or success with faculty skills and training.
- Students then progress to stages characterized by **relativism**, where they understand that their views and ideas need to be presented with evidence. They crave evidence, not simply emotion, in classroom dialogues. Faculty, as a guide and facilitator, can help students locate appropriate evidence to the discussion.
- The last set of stages are characterized by a sense of **commitment**. Students have traversed a full cycle and now make a well informed decision, choosing one approach over the other. This sense of commitment might apply to moral and cognitive issues as well. Kohlberg [41] and Gilligan [42] reinforce Perry's moral development theories [40] where students go from having strong, uninformed views to more subtle, accountable views, where their steps are assessed in context according to an assortment of factors.

Instructors must set reasonable expectations for the dialogue and its expected impact as they consider a student's current level of intellectual development. Development should not be coerced, rather, it should be fostered and motivated by presenting apt challenges and administering necessary support to cultivate knowledge-based growth [43]. Faculty skilled in facilitating difficult dialogues can use them as a tool to encourage student development and growth.

*Identity and Stereotypes in Cultural Discourse.* Identity development consists of psychological changes that influence behaviors (including classroom behaviors). Identity needs to be accomplished and constantly negotiated as each individual tries to balance developmental tensions and tasks during the course of their life [44]. Fries-Britt [45] talks about the struggles that high performing Black students, who are torn between identifying between their academics and their racial group face. Ultimately, their academic excellence might be viewed as "acting white." Tatum [46] observes that minority students aggressively question societal racism while White students are overloaded by the same allegations when both groups of students are at the same developmental stage Helms [47] calls this juxtaposition disintegration.

“Stereotype Threat” is the subtle initiation of stereotypes that can affect the learning and performance of a student [48]. Certain stereotypes are aggressive and estranging and can result in a toxic classroom environment Steele and Aronson [48] dealt with the stereotype that African Americans perform poorly on standardized tests. Two groups of African American students were given the test and one group was asked to indicate their race prior to taking the test. The study found that a negative stereotype was triggered in the minds of these African American



participants, as their race was called to attention. This resulted in lower performances compared to those African American students for whom the stereotype was not called to attention.

Parallel studies have also used common stereotypes for certain groups and have confirmed corresponding findings for different populations such as Hispanics [49], Asian Americans [50], women [51], older adult students [52], and people from low socioeconomic status [53].

### **University Response to Social Injustice and the Resulting Discourse**

George Floyd's death on May 25th, 2020 and the protests following are an example of the rising social unrest in the United States. On June 1, the president of Anonymous University sent a eulogy to the faculty and students, giving calls to action to make meaningful and lasting change to create a more equitable future for everyone. This letter implied that this was a matter of human rights. On that Friday, June 5th, the chancellor of Anonymous University made a statement to honor George Floyd. The statement announced a memorial service closing school but not classes.

Concerned that engineering students would have no support in addressing and coping with this event in their classes, the engineering education faculty chair of Anonymous University sought to gauge students' interest in discussing racial justice in their engineering classes. The chair used the memorial as a jumping-off point to discuss the recent events with her students. She surveyed her students in her data science and machine learning course which included students from multiple colleges, i.e., Engineering, Liberal Arts, Public Health, Business, Education, Architecture, Geosciences, Science, and Government and Public Policy. She asked students in a Google Form questions about if and how to discuss such things in their engineering classrooms.

The engineering education faculty chair was concerned about the impact of this second layer of mental pressure on engineering students already dealing with a global pandemic and the disruptions caused by it. Many engineers were currently taking no liberal arts courses where such topics are more frequently explored. Therefore, the only opportunity for them to discuss such topics would be in their engineering classes. The question remained as to if students would be receptive to such discussions.

At the same time, she also wanted to assess faculty's plans to support students in light of the stressors caused by social unrest, so she centered the next engineering education faculty meeting discussion around the topic. The engineering education faculty at Anonymous University consists of engineering faculty from multiple departments teaching traditional engineering subjects, many teaching summer classes to the affected engineering students. Thus, the chair of the engineering education faculty set the topic of Friday, June 5th's engineering education faculty meeting to discuss the events, their effect on the classroom, and how faculty were planning to respond in their classrooms. An invited moderator with expertise in discussing racial injustice gave the faculty the following prompt: "What are you, as an engineering faculty member,

worried about in terms of setting the right environment for all students given everything that’s going on in our learning environment now, specifically COVID and racial unrest?”

### **Data Collection**

The data discussed in this work come from a rapid response to a statement provided by the chancellor of Anonymous University in order to get feedback from both students and faculty while the topic remained fresh in everyone’s minds.

The engineering education faculty chair taught a stacked data science and machine learning (DSML) course with 87 graduate and undergraduate students from across nine colleges at the university. This DSML course was an accelerated summer course that met remotely for three hours each day, Monday through Friday. The students were asked to complete an optional survey as part of the class activities that day with the context that the chair would share their anonymized and aggregated results with the engineering education faculty group (EEFG) that met after the class.

The survey provided the following prompt: “What ideas do you have for how engineering faculty can address the unrest in their engineering classes?” This question was presented to the students as a Google Form with the instructions that they could share their thoughts on the matter whether it be suggestions, disagreements, or simply a statement of “I don’t know.” The students were asked to submit a blank form if they did not wish to participate in order to determine when everyone had finished giving their feedback. All of the students completed the survey and all but one consented to participate in the data analysis. The demographic breakdown of these students is given in Tables 1-2; five of the students’ demographics were not available in Anonymous University’s database. The race/ethnicity demographic names come from the database which distinguishes American and International students without further demographic breakdown for the latter.

**Table 1. Demographics of the DSML Students: College and Program Level**

<b>College \ Level</b>	<b>Undergraduate</b>	<b>Graduate</b>	<b>Total</b>
<b>Engineering</b>	18	22	40
<b>Liberal Arts</b>	7	13	20
<b>Business</b>	0	6	6
<b>Education and Human Development</b>	0	3	3
<b>Geosciences</b>	0	3	3

<b>Architecture</b>	1	0	1
<b>Government and Public Service</b>	0	2	2
<b>Marine Sciences</b>	1	1	2
<b>Science</b>	1	1	2
<b>Public Health</b>	1	0	1
	28	53	81

**Table 2. Demographics of DSML Students: Race/Ethnicity and Sex**

<b>Race/Ethnicity \ Sex</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
<b>Asian</b>	5	5	10
<b>Black</b>	3	0	3
<b>Hispanic/Latino</b>	8	2	10
<b>White</b>	12	16	28
<b>International</b>	11	18	29
<b>Declined to Provide</b>	1	0	1
	40	41	81

The EEFG holds weekly meetings over Zoom and consists of faculty members and graduate students from multiple departments that have an interest in improving engineering education at Anonymous University. Before COVID, the EEFG faculty met monthly to discuss plans, topics, and concerns, but these meetings became weekly due to heightened concerns from the faculty about creating an effective learning environment after the sudden shift to online learning. As such, meetings frequently involve attendees sharing their concerns about their classrooms and seeking advice and insight from the others.

The EEFG meeting this day was facilitated by the former provost and engineering education expert, hereon referred to as the meeting lead. There were 20 attendees including the engineering education faculty chair; the demographics of the EEFG attendees are provided in Table 3. The

agenda for this meeting included an engineering education expert guest speaker and a round-robin discussion about addressing the social unrest in their classrooms. After the guest speaker gave a short talk on how to be effective in the classroom, the meeting lead facilitated the round-robin discussion with the following prompt: “What are you as a College of Engineering faculty member worried about in terms of setting the right environment for all students given everything that’s going on in our learning environment now, specifically COVID and racial unrest?” With consent from the participants, the Zoom session was recorded and transcribed for later analysis.

**Table 3. Demographics of EEFG Meeting Attendees**

<b>Race/Ethnicity \ Sex</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
<b>Black</b>	1	1	2
<b>Hispanic</b>	0	1	1
<b>Indian</b>	3	1	4
<b>White</b>	5	8	13
	9	11	20

**Data Evaluation**

Grounded theory was performed by two researchers on the DSML survey responses and on the EEFG round-robin discussion transcript to extract patterns from the qualitative, open-ended responses. This technique is a common practice for qualitative data analysis in order to discover themes in the data [54–55]. Due to the length of the responses to the DSML survey and the organization of the EEFG discussion, a particular code can appear at most once in a single response but multiple codes can appear in the same response.

As is standard, the analysis process involved the researchers reading through and annotating the anonymized data, marking recurrent topics and ideas as codes. These codes went through multiple passes as the researchers determined that rare codes should be merged with other codes to better represent the overall themes in the data or simply were outlier responses. These refined codes were then analyzed and grouped into categories; the counts of each code are tracked during this process for later analysis. Each researcher performed the coding task independently to avoid biasing the final output. Additionally, the transcript of the meeting lead and the expert guest speaker were included to maintain the context of the discussion, but none of their comments were coded as they were not speaking on the prompt. The categories that resulted from the grounded theory are provided in Tables 4 and 5.

**Table 4. DSML Survey Categories**

<b>No.</b>	<b>Category</b>	<b>Count</b>	<b>%</b>
1	Open Discussions Between Faculty and Students	44	51%
2	Include Ethics Issues and Current Events in Classroom	42	49%
3	Assignments on Ethics in Classroom	37	43%
4	Perspectives on Race	27	31%
5	Acknowledge Discrimination and Privilege	23	27%
6	Faculty Should Address Ethics Topics and Unrest in Classrooms	16	24%
7	Ethical Responsibility	15	17%
8	No Answer, No Opinion, No Change	14	16%
9	Faculty Should be More Empathetic/Supportive	13	15%
10	Dedicated Ethics Course	7	8%
11	Have Faculty Reach Out More	7	8%
12	Promote Importance of Respect	5	6%
13	Hold Diversity & Inclusion Training	4	5%
14	Encourage Diverse Group Collaboration	3	3%

**Table 5. EEFG Round-Robin Categories**

<b>No.</b>	<b>Category</b>	<b>Count</b>	<b>%</b>
1	Ill-Equipped to Talk About It / Don't Know the Right Answers	11	52%
2	Worried About Effectiveness in Virtual Classroom	11	52%
3	Connections with Students	8	38%
4	Student Anxiety / Safe Environment	8	38%
5	Engineering Ethics and Inclusive Mindsets	6	26%

6	Racism and Racial Unrest	4	19%
7	Faculty Influence on Students / Engaging Students	4	19%

Somewhat surprisingly, students were very open to the idea of discussing social issues in their engineering classrooms and suggested a variety of classroom activities. For example:

- “Have the profs address the issue directly, and inform and educate the students on the issues at hand”
- “Have a open discussion where faculty leads or has someone else come in and encourage students to talk about professional experiences and how they've felt/seen racism in work vs school”
- “I think this information can be shared in between lectures by examples, its consequences on current society, on people's lives”
- “I think the best way to address the unrest in classes would be having a written prompt every month on a current event taking place in america and having people respond with their opinions and how this topic affects them”

By contrast, faculty primarily voiced concerns about discussing social issues while acknowledging their importance in creating inclusive classrooms. For example:

- “...how to integrate the inclusive mindset into our classroom teaching”
- “I’m worried about being ill-equipped to deal with these things that need to be discussed and addressed”
- “I know that because I don’t know much. I’m really scared and worried about saying something politically stupid.”
- “...microaggressions and other forms of racial and gender bias...”
- “...how to keep students encouraged and engaged...”

While the prompts were different to better fit each audience (i.e., students vs. faculty), the core question was the same: how to address topics relating to social unrest in engineering classrooms. Students were asked to share their thoughts on how faculty could address social unrest in engineering classrooms with the priming that they can share their honest opinions including “I don’t know” and “I don’t think they should be discussed in engineering classrooms.” Faculty were asked to discuss how to create the right environment in their engineering classrooms in light of the social unrest with the priming of needing to discuss or at least address it in their classrooms. As a result, there was an unsurprisingly significant overlap between the sets of categories. To more effectively analyze how the responses differed between students and faculty, the two category sets were aligned with respect to the intersection of the prompts that created them.

From the DSML survey categories, “DSML Category 13: Hold Diversity & Inclusion Training” and “DSML Category 10: Dedicated Ethics Course” were dropped from the aligned set as they called for actions outside of the faculty’s classrooms which had no counterpart in the EEFG categories. From the EEFG round-robin categories, “EEFG Category 2: Worried About Effectiveness in Virtual Classroom” was dropped because it centered on the faculty’s feelings about the virtual classroom environment in general which no students voiced as they would not have the concern of speaking incorrectly on sensitive topics as an authority figure. Due to the difference in data size, the DSML survey produced more categories, but some of these categories represent facets of the categories from the EEFG round-robin categories. As such, some of the DSML survey categories are merged in the alignment. The category counts were aggregated using an or-logic, i.e., every aggregated category has a maximum count of one.

From these two category sets, two separate researchers independently aligned the categories. The first researcher’s categories were taken as the aligned categories as shown in Table 6, which led to the listing of six aligned categories. The second researcher's independently-aligned categories resulted in the listing of five separate aligned categories:

- Category 1: Connections / Communication Between Faculty and Students: Labeled as Increase Faculty Engagement and Support to Students by the second researcher.
- Category 2: Ethics in Classroom: Labeled as Provide Dedicated Course Topics on Ethics.
- Category 3: Faculty Empathy / Support, Student Anxiety: Also labeled as Increase Faculty Engagement and Support to Students. Combined with Category 1.
- Category 4: Discussions of Race, Privilege, Unrest: Labeled as Have Conversations on Race and Diversity.
- Category 5: Faculty Should Acknowledge Unrest / Social Topics Because Of Their Influence: Labeled as Have Conversations on Race and Diversity.
- Category 6: Concern About Change / Don't Want Change. Labeled as Status Quo.

Upon closer inspection of both researcher's independently aligned categories, the only major difference between their aligned categorizations was the second researcher's creation of a category that was listed as two separate categories from the first researcher (i.e., Categories 1 and 3). From this, the intersection was agreed upon by two researchers discussing the content contained within each category and determining whether the other category set covered the same topics in a similar fashion to how multiple sets of codes are aligned during grounded theory.

**Table 6. Aligned Grounded Theory Categories Between DSML Survey and EEFG Round-Robin Responses**

<b>Aligned Category</b>	<b>DSML Categories</b>	<b>EEFG Category</b>	<b>DSML Count</b>	<b>EEFG Count</b>	<b>DSML %</b>	<b>EEFG %</b>
<b>Category 1:</b> Connections / Communication Between Faculty and Students	<b>Category 1:</b> Open Discussions Between Faculty and Students <b>Category 11:</b> Have Faculty Reach Out More	<b>Category 3:</b> Connections with Students	<b>46</b>	<b>8</b>	<b>53%</b>	<b>38%</b>
<b>Category 2:</b> Ethics in Classroom	<b>Category 7:</b> Ethical Responsibility <b>Category 3:</b> Assignments on Ethics in Classroom <b>Category 12:</b> Promote Importance of Respect <b>Category 14:</b> Encourage Diverse Group Collaboration <b>Category 2:</b> Include Ethics Issues and Current Events in Classroom	<b>Category 5:</b> Engineering Ethics and Inclusive Mindsets	<b>66</b>	<b>6</b>	<b>77%</b>	<b>26%</b>
<b>Category 3:</b> Faculty Empathy / Support, Student Anxiety	<b>Category 9:</b> Faculty Should be More Empathetic/Supportive	<b>Category 4:</b> Student Anxiety / Safe Environment	<b>13</b>	<b>8</b>	<b>15%</b>	<b>38%</b>
<b>Category 4:</b> Discussions of Race, Privilege, Unrest	<b>Category 4:</b> Perspectives on Race <b>Category 5:</b> Acknowledge Discrimination and Privilege	<b>Category 6:</b> Racism and Racial Unrest	<b>27</b>	<b>4</b>	<b>31%</b>	<b>19%</b>
<b>Category 5:</b> Faculty Should Acknowledge Unrest / Social Topics Because Of Their	<b>Category 6:</b> Faculty Should Address Ethics Topics and Unrest in Classrooms	<b>Category 7:</b> Faculty Influence on Students / Engaging Students	<b>21</b>	<b>4</b>	<b>24%</b>	<b>19%</b>



Influence						
<b>Category 6:</b> Concern About Change / Don't Want Change	<b>Category 8:</b> No Answer, No Opinion, No Change	<b>Category 1:</b> Ill-Equipped to Talk About It / Don't Know the Right Answers	<b>14</b>	<b>11</b>	<b>16%</b>	<b>52%</b>

**Evaluation Findings**

From Table 4, while 12 of the 86 students were not interested in adding any curriculum relating to engineering ethics to their engineering classes, the other 74 students had suggestions and were interested in having their instructors discuss these topics with them in class. Students suggested integrating ethics issues and current events into their coursework, integrating ethics into their engineering projects, discussing case studies, and having lectures that focus on racial injustice and historic social inequities that their future engineering problems need to consider.

Additionally, many voiced interest in having open channels of communication between them and their instructors, hearing the faculty acknowledge current events, and having the opportunity to talk to the faculty about what concerns them. Several students commented on the importance of learning ethics as an engineer and learning to be inclusive and empathetic. The most common codes belong to “DSML Category 1: Open Discussions Between Faculty and Students”, “DSML Category 2: Include Ethics Issues and Current Events in Classroom”, and “DSML Category 3: Assignments on Ethics in Classroom.”

From Table 5, In general, the EEFG faculty were in agreement that discussing topics related to ethics in the classroom is important. In fact, several attendees shared classroom practices to promote an inclusive environment, e.g., integrating an inclusive mindset into classroom teaching and reading books about marginalized groups in engineering to broaden perspectives. However, the faculty also voiced strong concerns about being qualified to talk on matters such as the social unrest and how to effectively connect with students in the virtual classroom environment. They felt that many of the practices that they implemented in traditional, face-to-face classes would not translate into the virtual environment. With all of the stresses the students are going through due to the situation caused by COVID-19 and the social unrest, the faculty were torn between their desire to create a safe and engaging environment for their students and their concern of adding to those stresses by mishandling topics such as ethics and inclusivity in the classroom. The most common codes belong to “EEFG Category 1: Ill-Equipped to Talk About It / Don't Know the Right Answers” and “EEFG Category 2: Worried About Effectiveness in Virtual Classroom.”

With the categories aligned in Table 6, it becomes possible to conduct a Chi-Square ( $\chi^2$ ) analysis to determine if and how the responses from the students and faculty differed using the counts of each category as features. With a  $\chi^2$  value of 22.76 and five degrees of freedom, the results of the analysis were statistically significant with  $p < 0.01$ . The categories that mark the differences in the responses from their expected values are “Category 2: Ethics in Classroom”, “Category 3: Faculty Empathy/Support, Student Anxiety”, and “Category 6: Concern About Change / Don't Want Change”. Students responded that they wanted ethics to be part of their classroom materials and discussions more than expected while faculty included these topics in their answers less than expected. Conversely, faculty commented on their concerns about implementing change, citing their influence over the students if they addressed these topics in class. However, students did not share this concern, voicing this theme less than the expected value.

## **Discussion**

Faculty are highly aware of their impact on the students. As a result, they are cautious about discussing serious topics such as racial unrest in their classrooms for fear of mishandling them, further marginalizing the students they want to support and acknowledge. The results from the student survey should help assuage those concerns. Students strongly responded that they were interested in discussing topics related to ethics and inclusivity in their classrooms and having curricula based around these topics. 74 out of 86 of the responses were in favor of discussion and coursework around these topics and provided ideas of how to do so. The Chi-Square analysis showed that students are more interested in covering these topics in their classrooms than expected when compared to the faculty responses in their discussion.

## **Conclusion**

Students look to the faculty for guidance and support. Students are interested in having open channels of communication with their professors and having the ability to talk about these topics in their classrooms. Faculty should not be afraid to bring these topics up in their engineering classes as shown by students' desire to have faculty acknowledge them. As evidenced by the effectiveness of the engineering education faculty chair's survey, faculty can reach out to their students and give them a medium to voice their thoughts and concerns and get positive results. Outside of that, faculty can integrate these topics into their coursework and class discussions. The most important takeaway is that students want to know that the faculty are aware of what is going on in their lives outside of the classroom and how it impacts them both personally and professionally as engineers. The first step faculty can take is to acknowledge these events and ensure students that the faculty are there to listen and support them.

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